

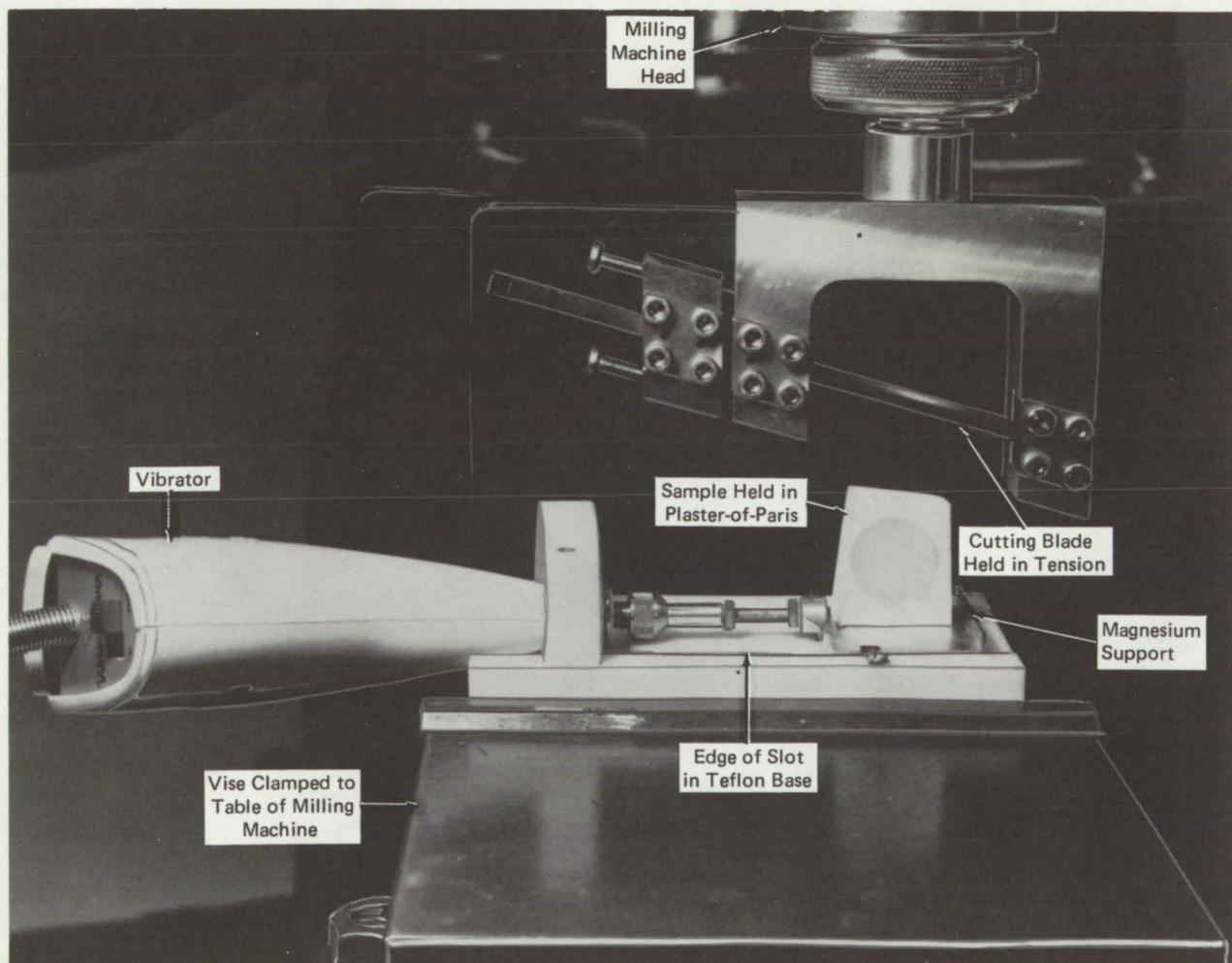
NASA TECH BRIEF

NASA Pasadena Office



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Apparatus for Cutting Elastomeric Materials



Apparatus for Cutting Elastomeric Materials

The problem:

On rare occasions, an artificial heart can fail when an elastomeric sphere used as a poppet in a check valve sticks or leaks. The physical cause of this failure remains unknown. To analyze the physical properties of such a sphere, it is necessary to cut it up into the smallest

possible specimens and to study them thoroughly to see how the entire structure has been affected. Conventional cutting techniques, however, are inadequate for this purpose because the pressure of the cutting edge distorts the sphere, causing uneven cut surfaces and inexact dimensions.

(continued overleaf)

The solution:

An apparatus has been developed which can cut elastomeric material to very accurate dimensions and will leave the cut surfaces extremely flat.

How it's done:

The illustration shows how the elastomeric material is cut by vibrating it under a knife blade. The material to be cut is affixed to a support made of magnesium, to minimize the mass that must be vibrated. When spheres are to be cut they are held in a plaster-of-Paris mold. The support is constrained to slide in a slot cut in Teflon, the latter being used because of its very low coefficient of friction. A 12-watt vibrator, such as is used for etching metal, is affixed to the support so that it can be made to vibrate linearly at 60 Hz.

A sharp thin cutting edge, such as a commercial razorband strap, is held in tension in a fixture that, in turn, is held in the head of a milling machine designed for metalworking. The controls of the machine are used to position the cutting edge in the same plane as the vibrating specimen. The controls then are operated, making the blade come into contact with the specimen, to cut it into the shapes and sizes desired.

Cut specimens of silicone materials prepared to date have included 1/8-inch (3.2-mm) cubes and pieces 2 by 1/4 by 0.080 inches (51 by 6.4 by 2.03 mm), cut from sheets of initially spherical samples having a Shore A hardness of 60. Dimensions can be held to ± 0.002 inch (0.025 mm). Cut surfaces, when viewed in high-incidence reflected light, appear mirror-smooth; the vibrating mechanism causes no visible striations.

Note:

Requests for further information may be directed to:
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Patent status:

NASA has decided not to apply for a patent.

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